

Acoustic Horizontal Coherence and Beamwidth Variability Observed in ASIAEX (SCS)

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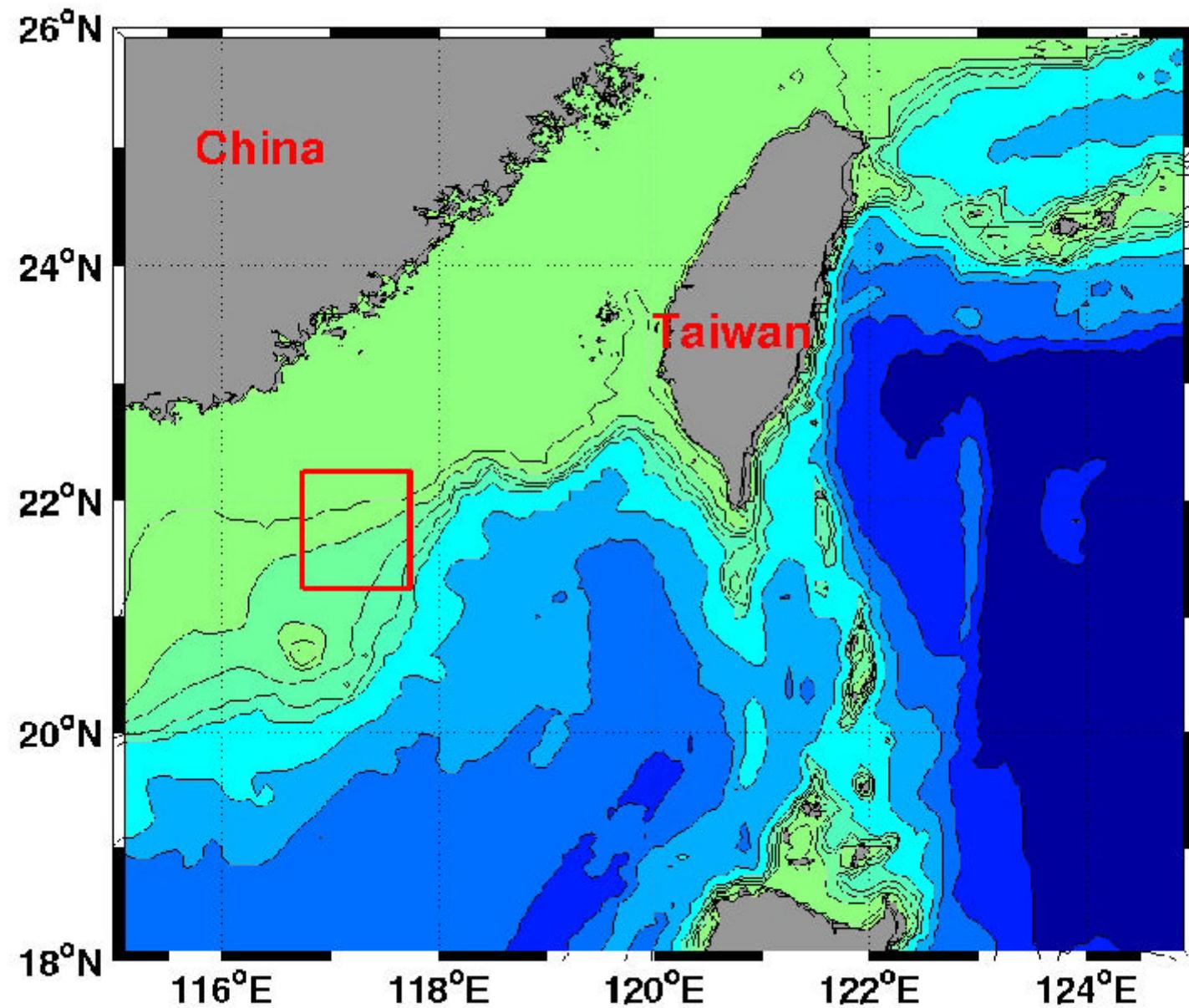
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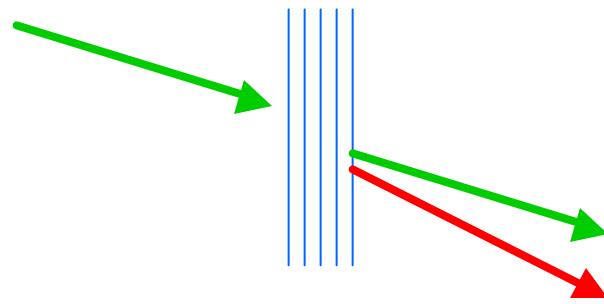
GOALS

**Relate Acoustic Coherence to Water Column
Inhomogeneity and Anisotropy**

**Contrast Coherence under Isotropic and Anisotropic
Conditions**

Coupling-induced Refraction

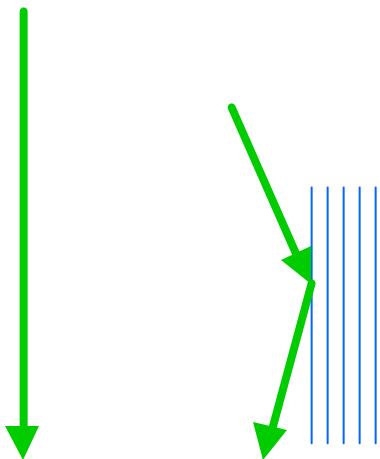
Independent of array orientation
Strongly dependent on IW orientation



Large Incidence Angle:
Coupling to mode with
different phase speed

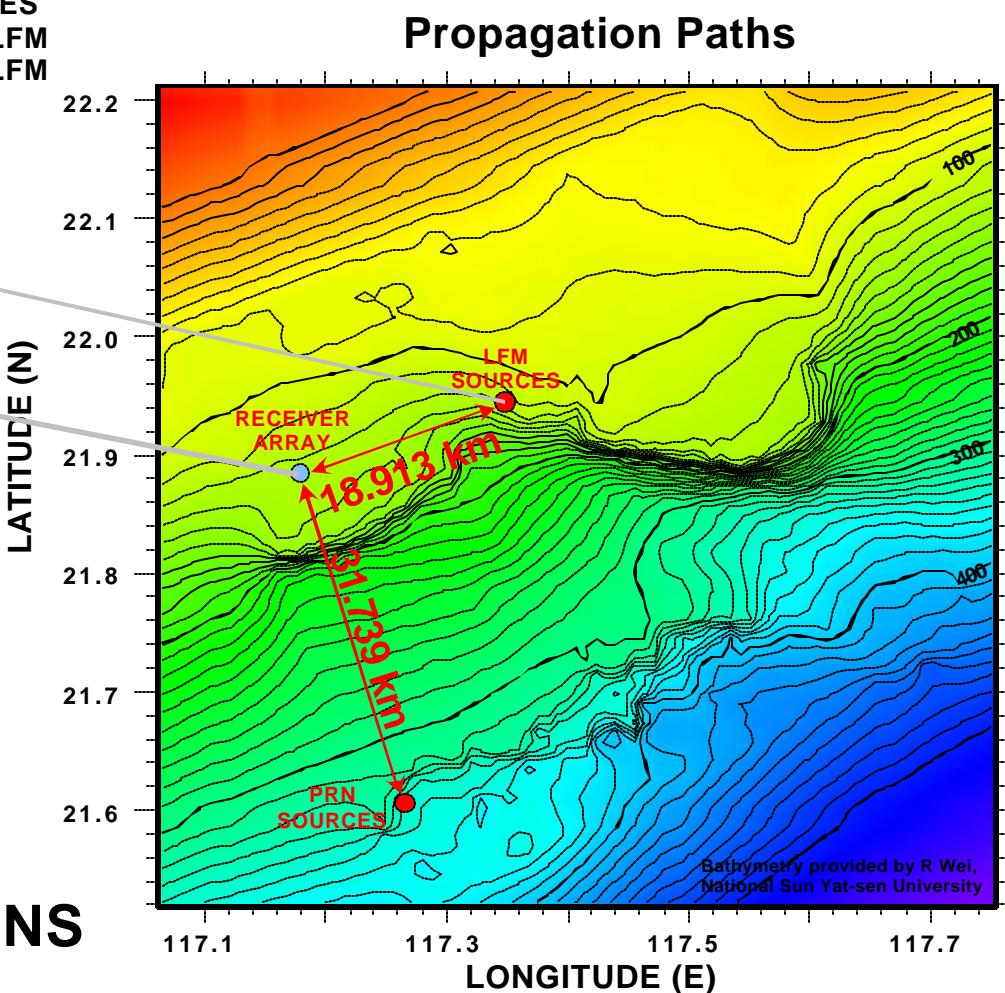
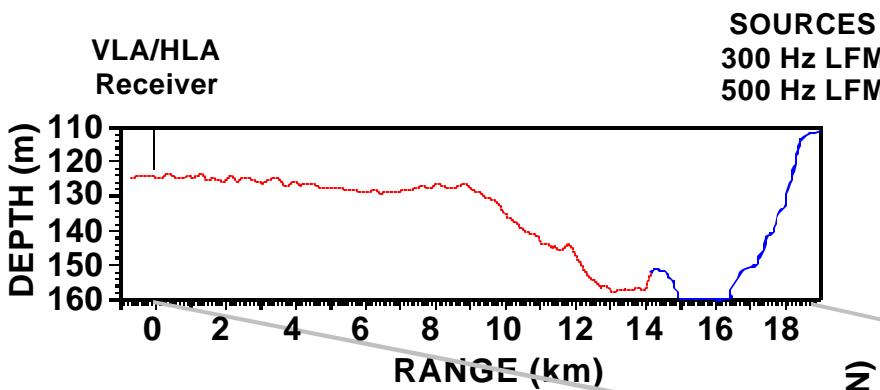
$$\sin \phi_2 = \sin \phi_1 C_2 / C_1$$
$$\delta\phi \sim (C_2/C_1) - 1$$

Adiabatic Refraction – near grazing incidence

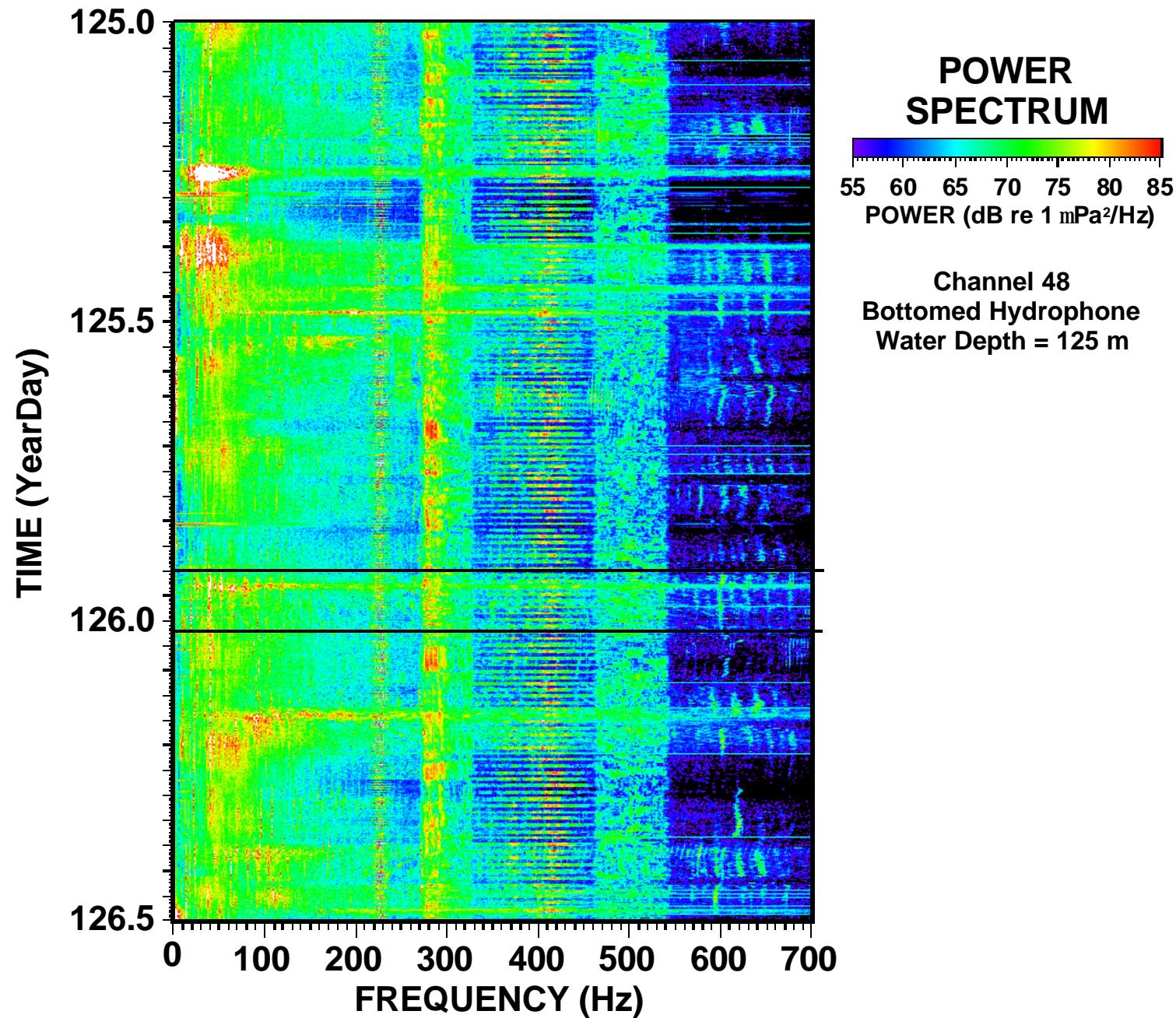


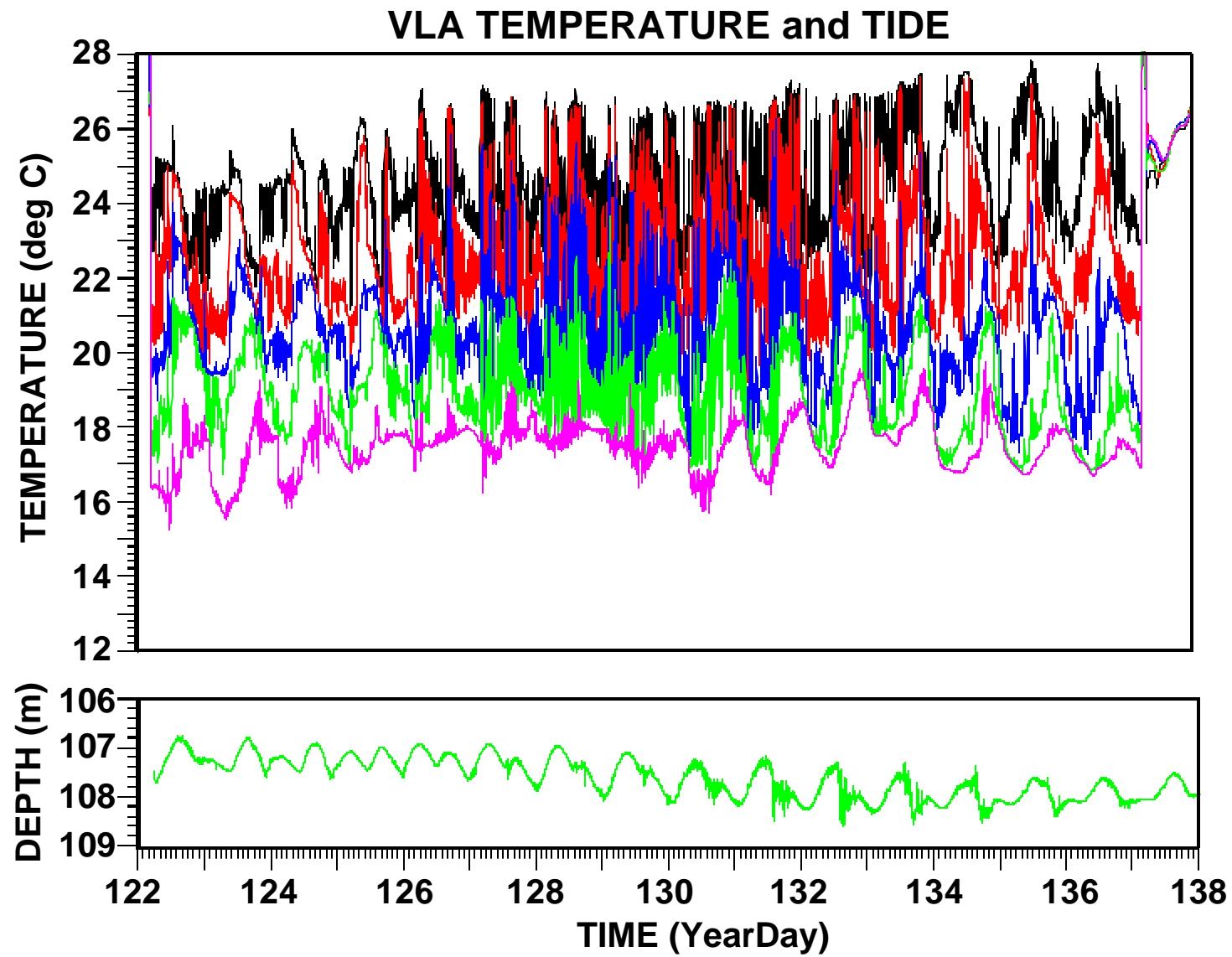
Small Incidence Angle:
Refraction due to local
change in modal phase
speed

$$\cos(\delta\phi/2) < C_1 / C'_1 ; C' > C$$

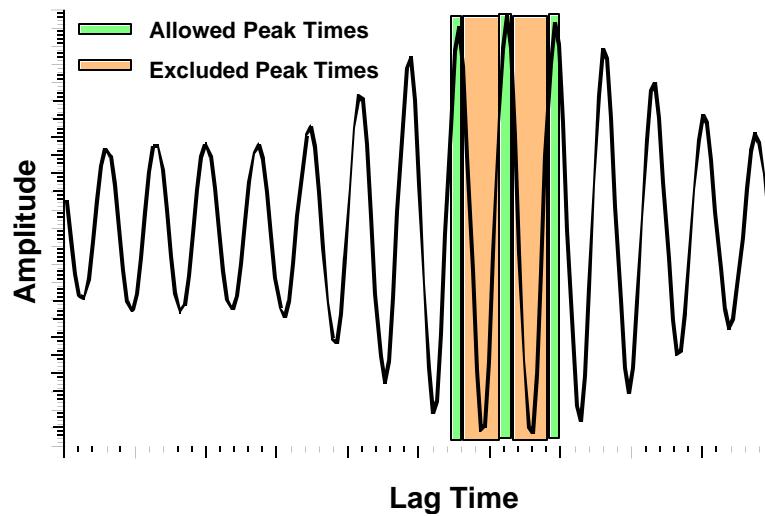
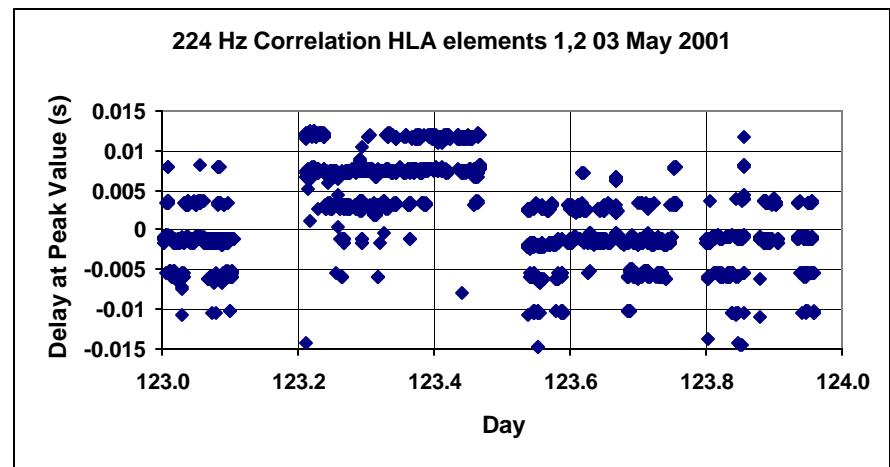
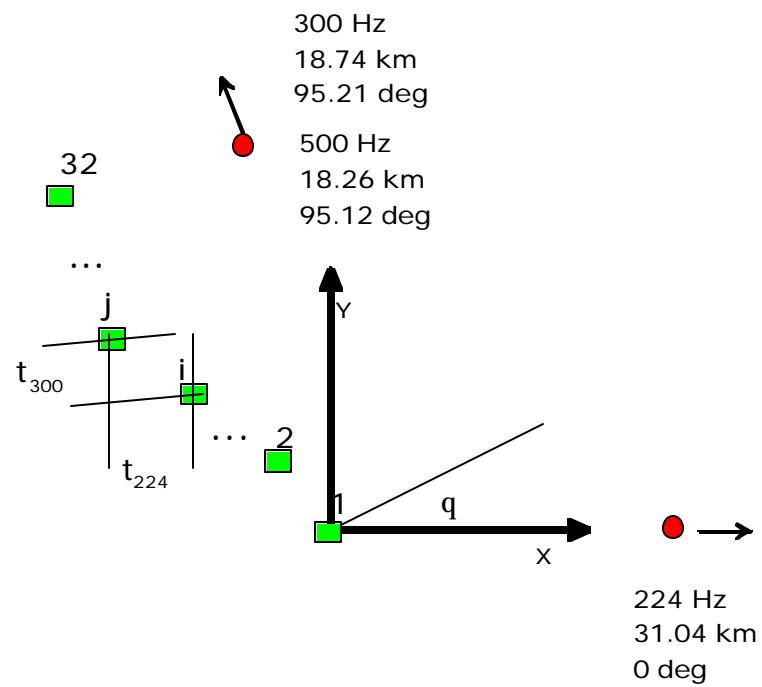


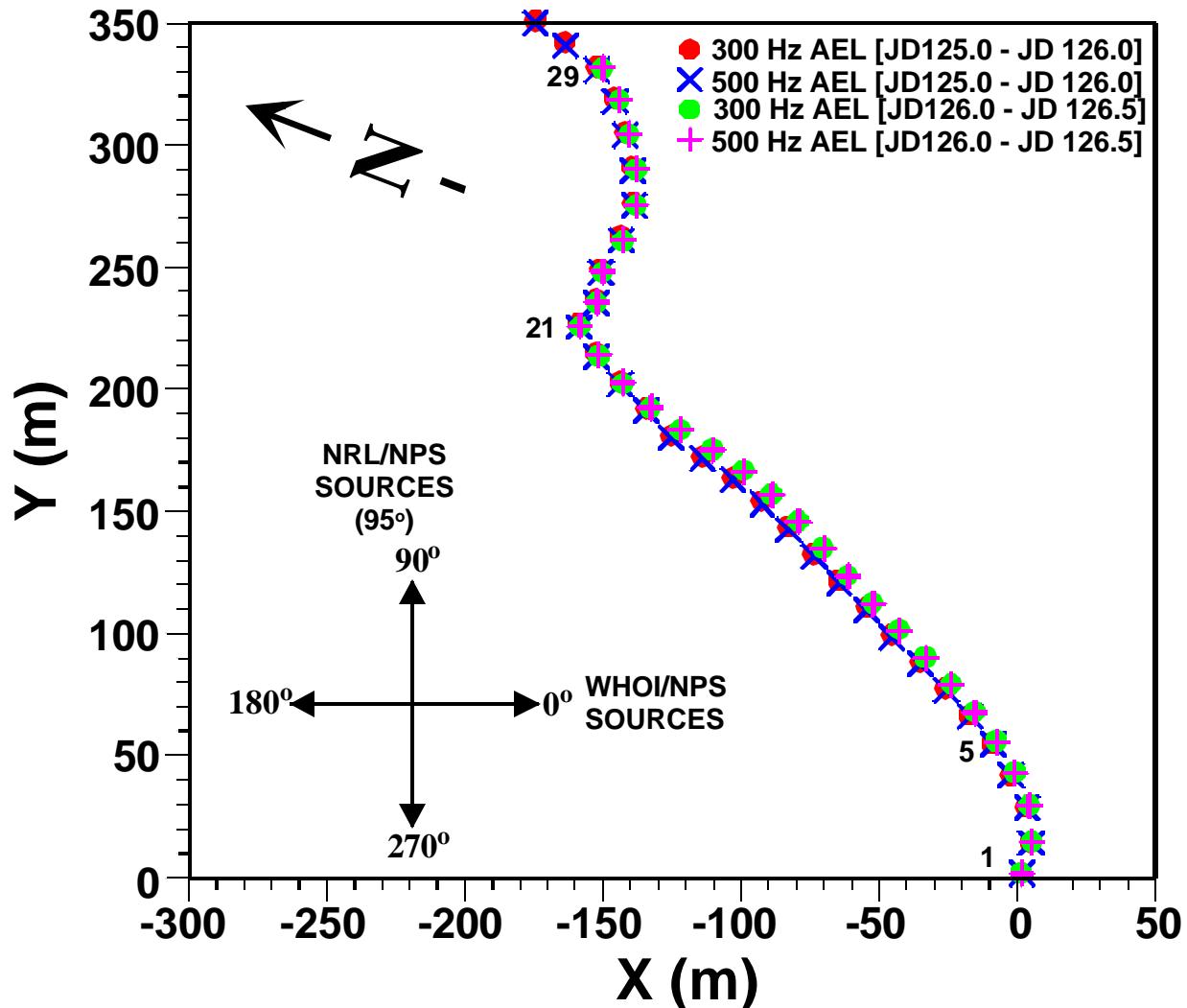
ASIAEx 01 ACOUSTIC ASSET LOCATIONS SITE BATHYMETRY





Array Element Localization



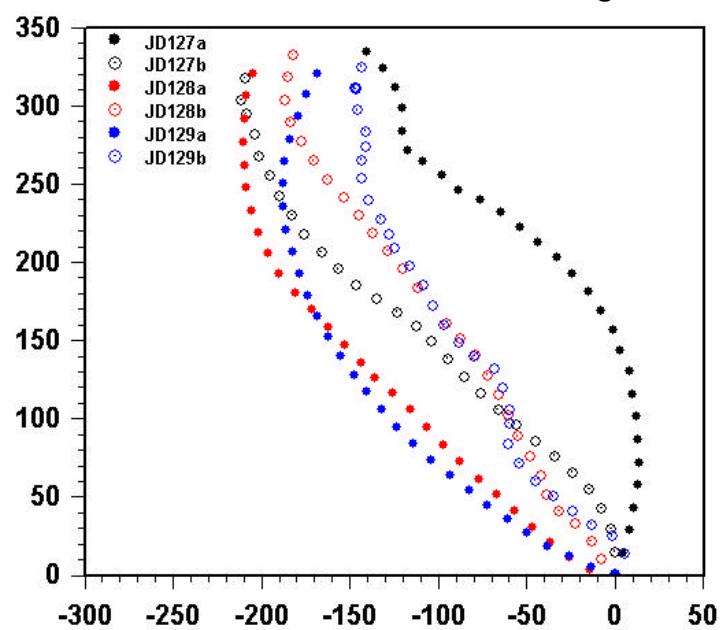
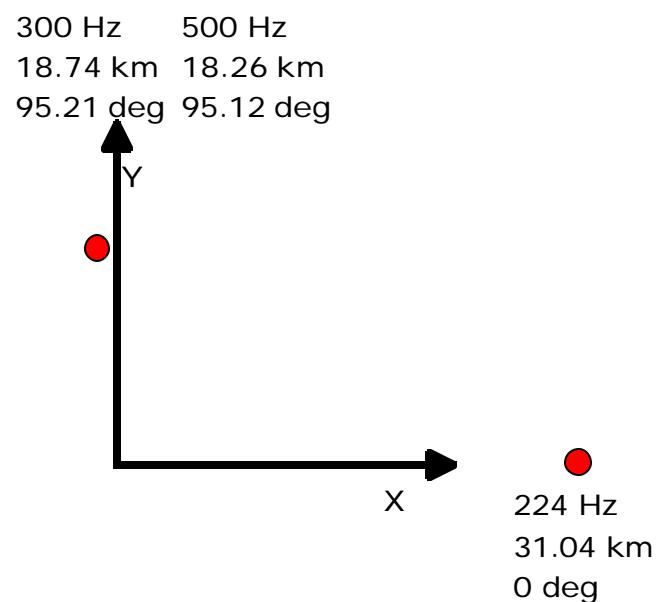


**Localizations valid
for periods of hours
to ~ 1 day**

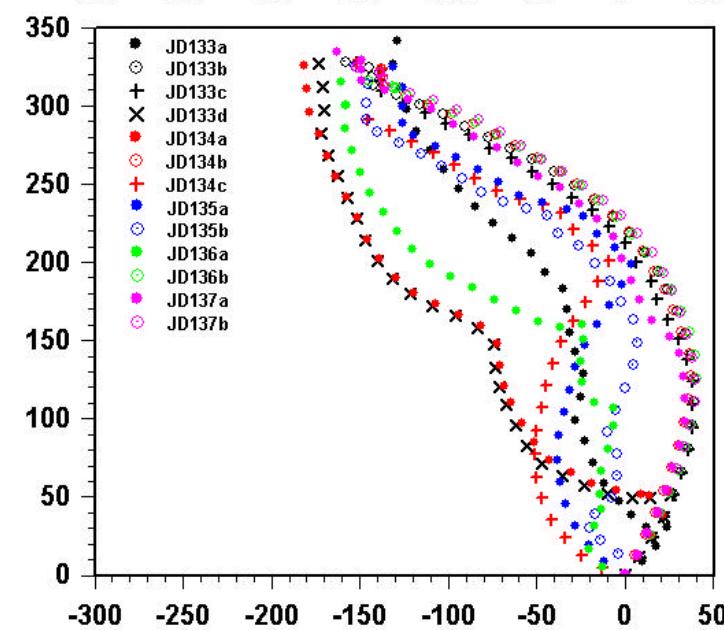
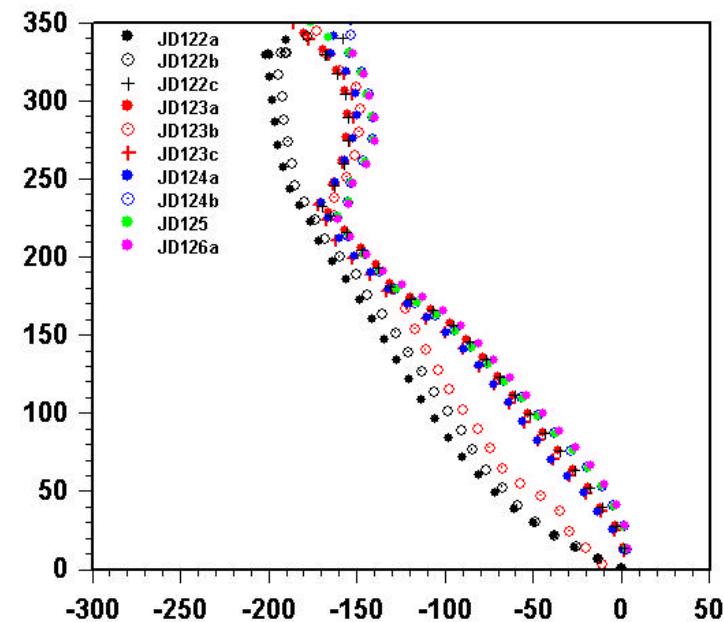
**Good (0.4 m typical)
agreement at 300/500 Hz**

**Agreement with light bulb
implosion localization**

**Motion smallest early
in recording period**



ELEMENT LOCATION RELATIVE TO CHANNEL W17



Numerical Testing

Nearfield corrections not required

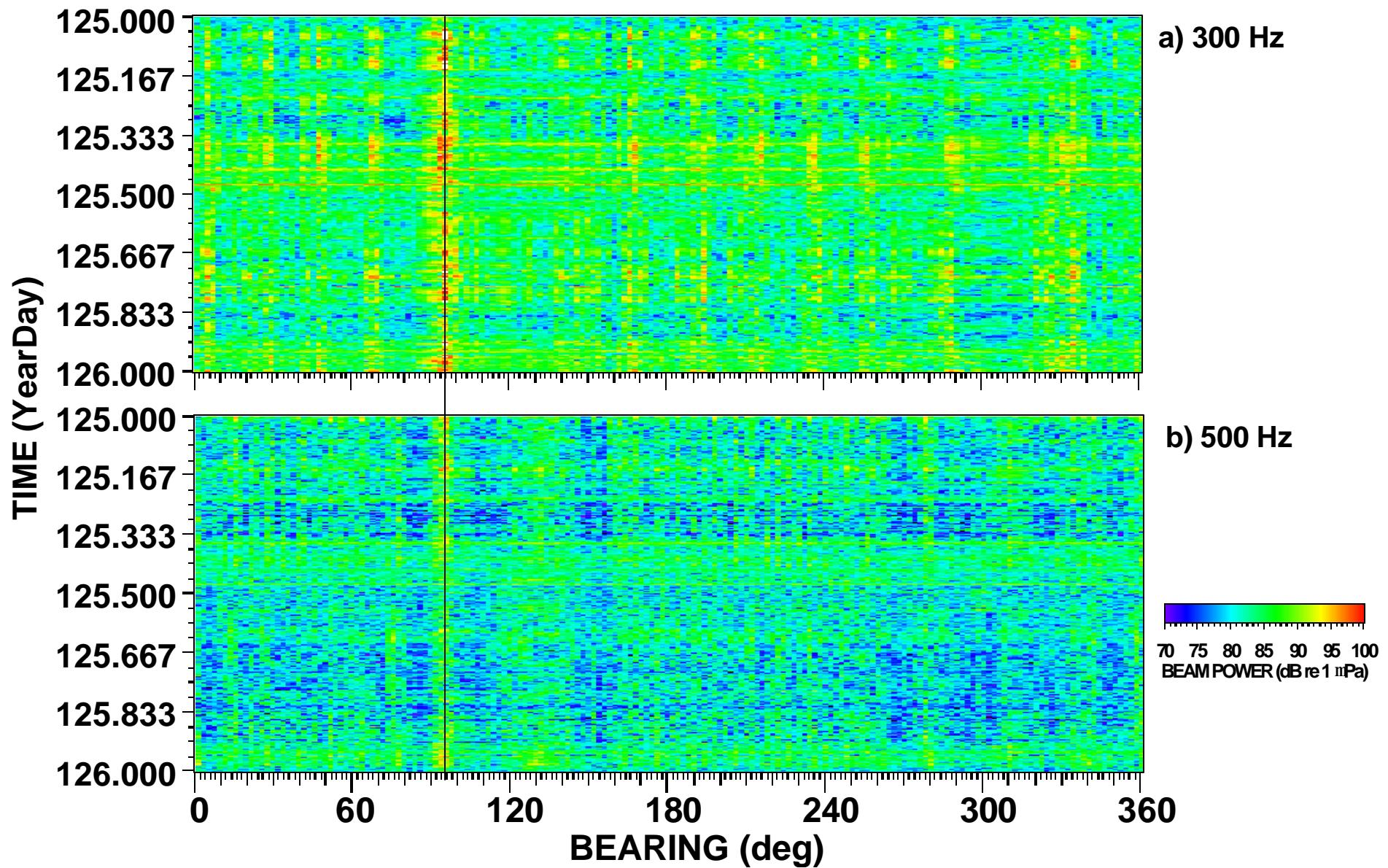
**ASG and resolution can be calculated using
plane wave field**

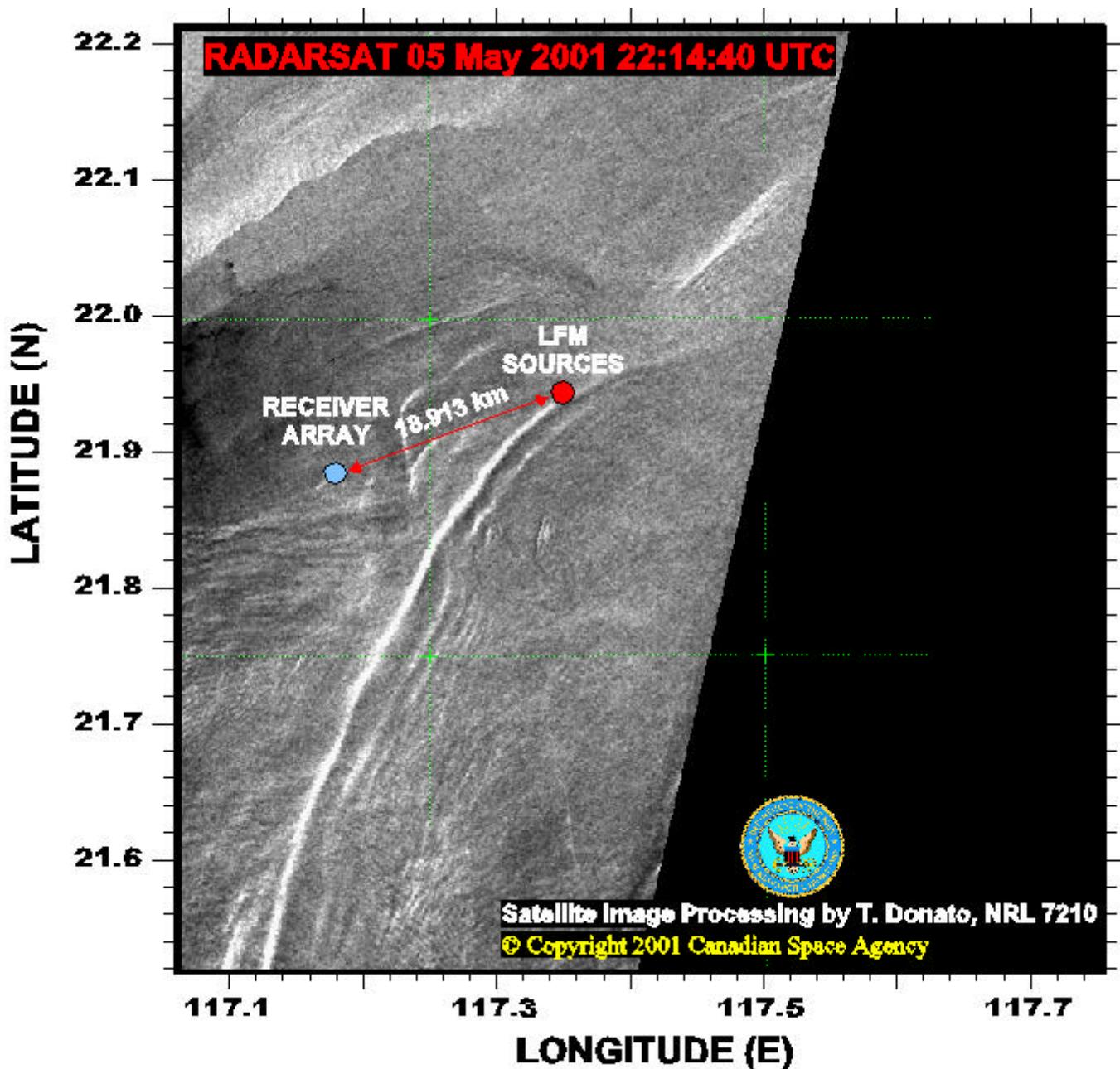
Bearing bias due to phase speed mismatch

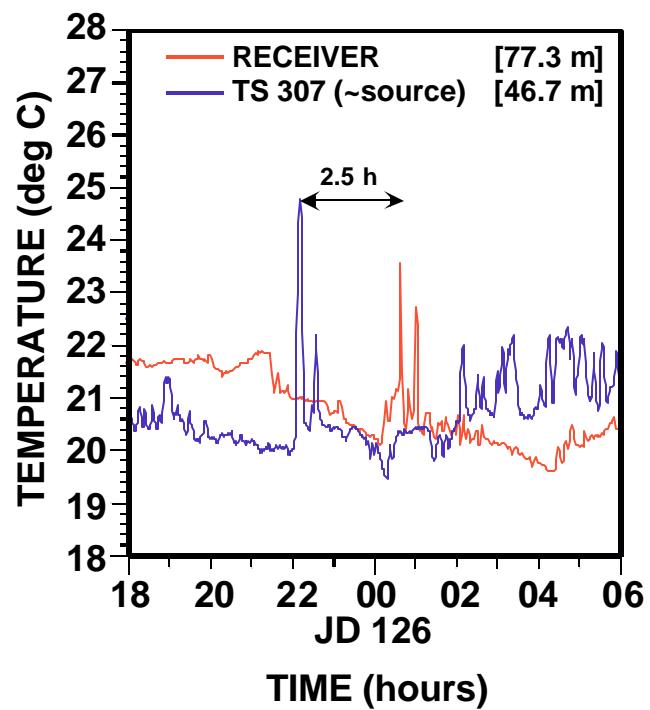
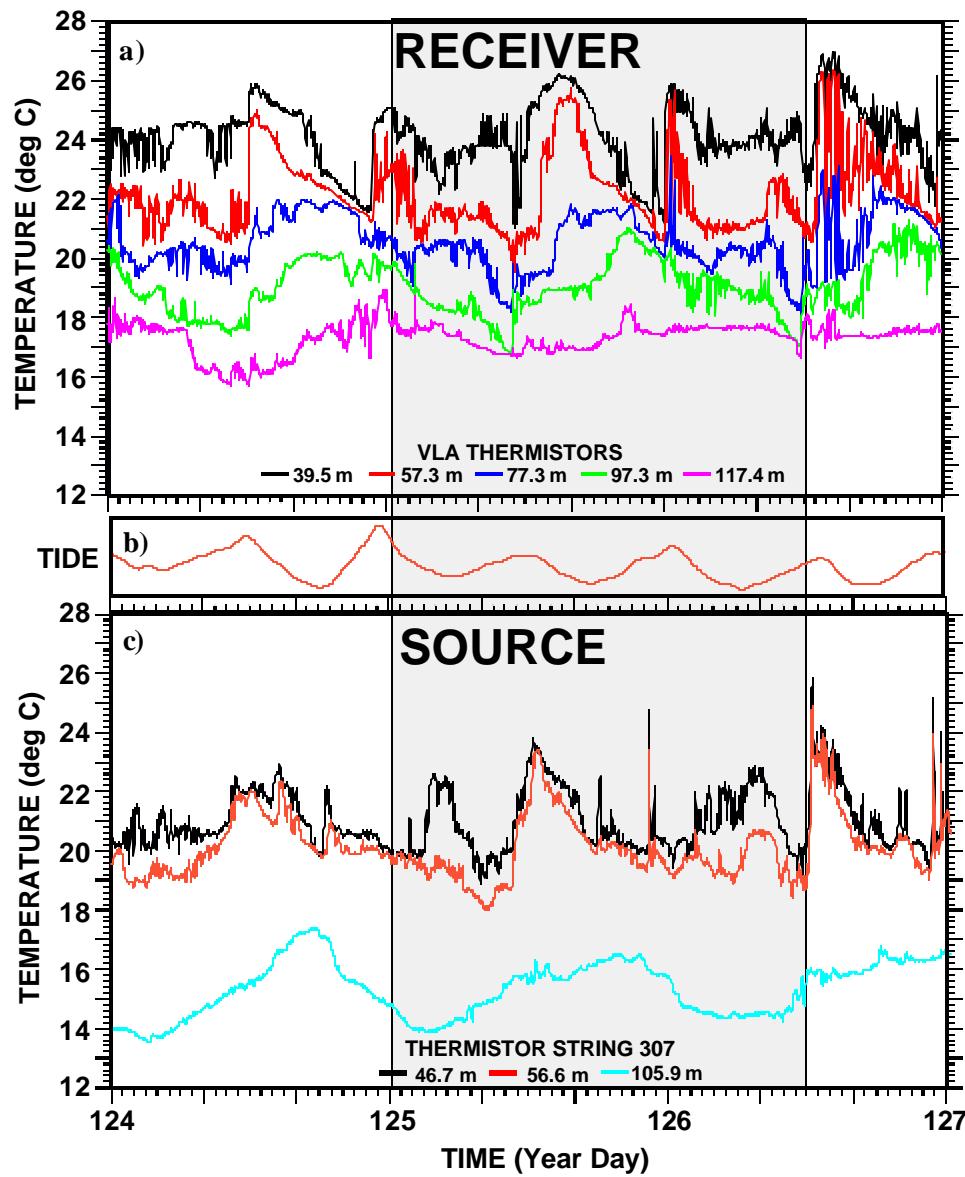
Can use plane wave field calculation

**Planar shape removes grating lobe
ambiguity**

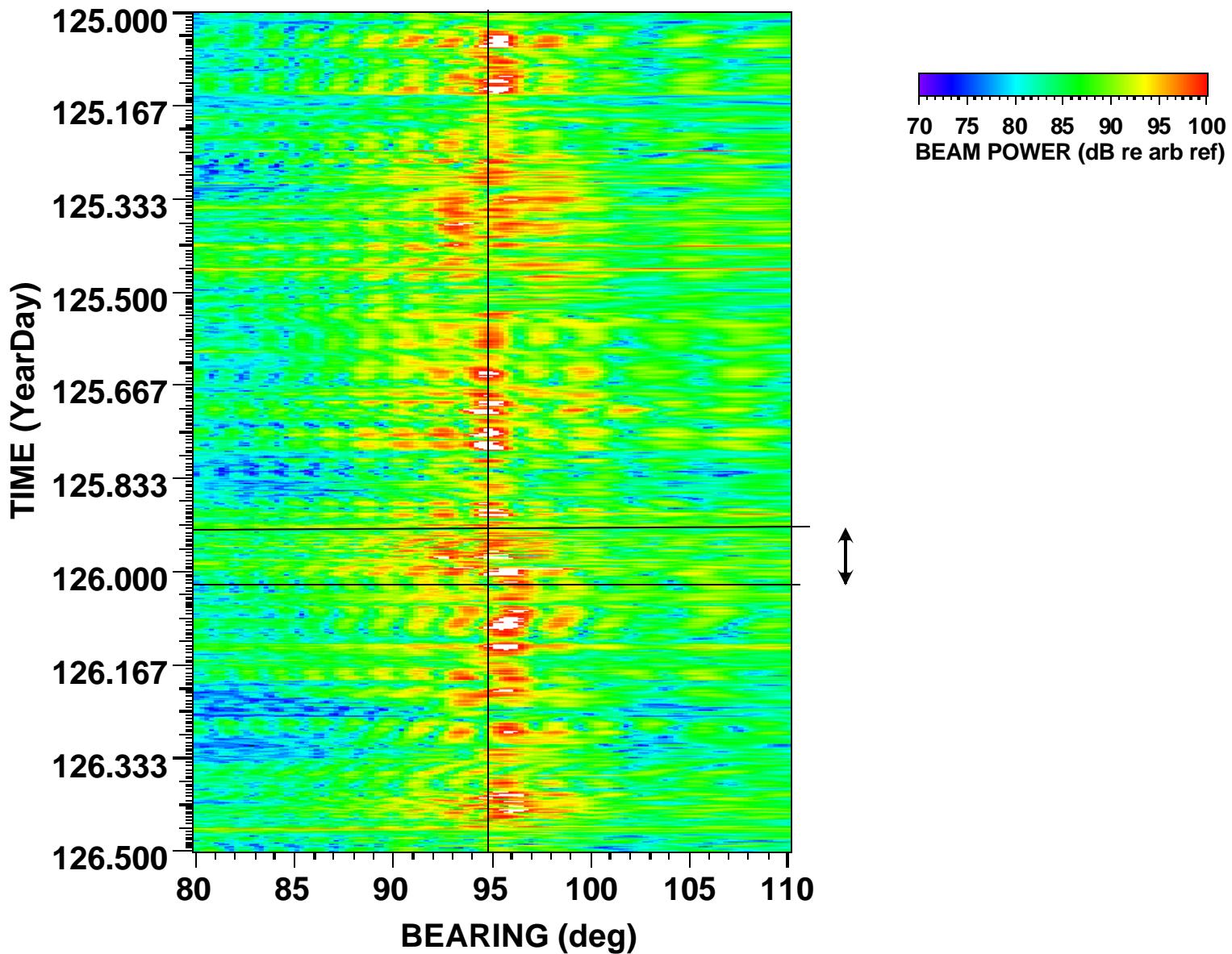
CONVENTIONAL LINEAR BEAMFORM

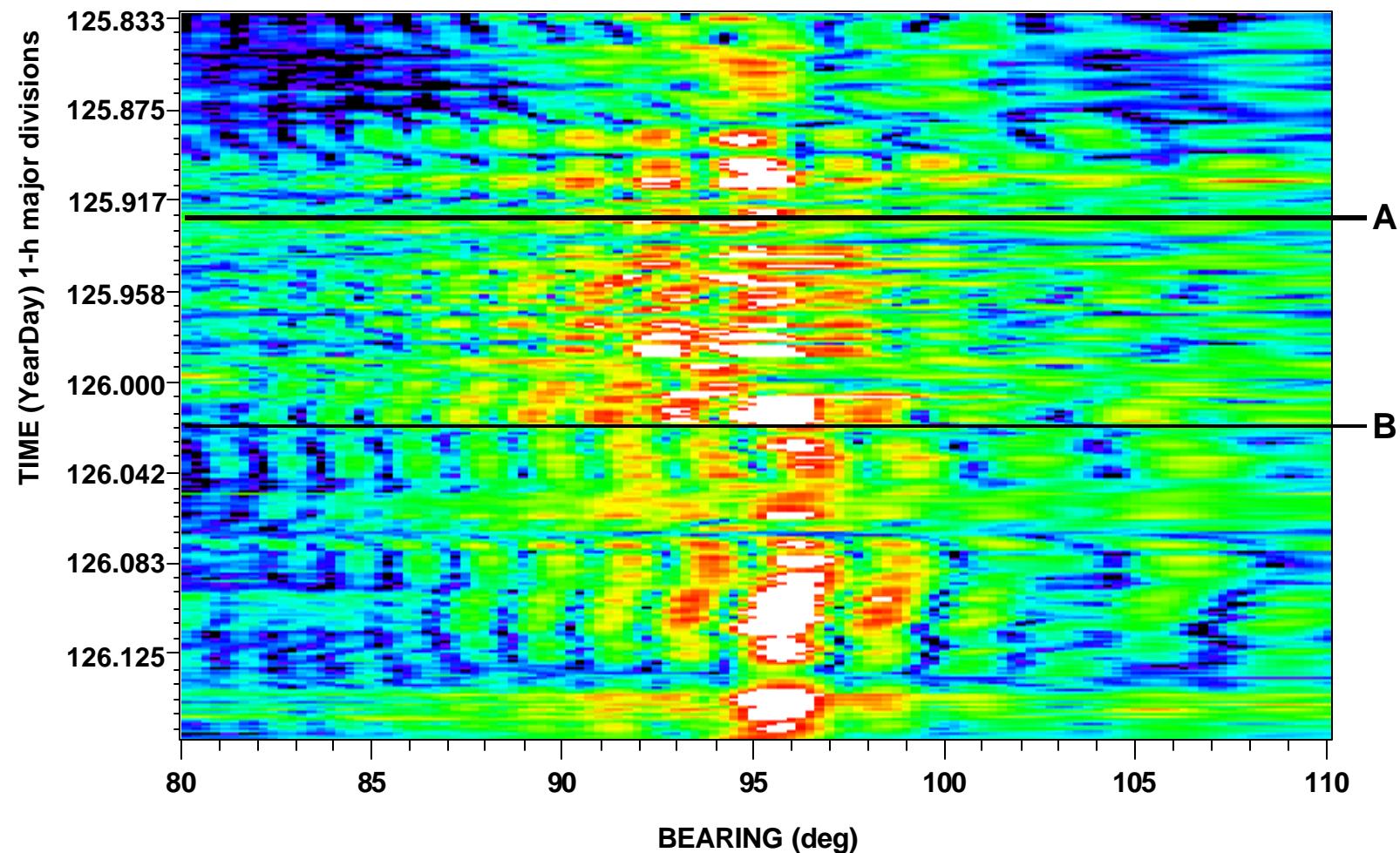


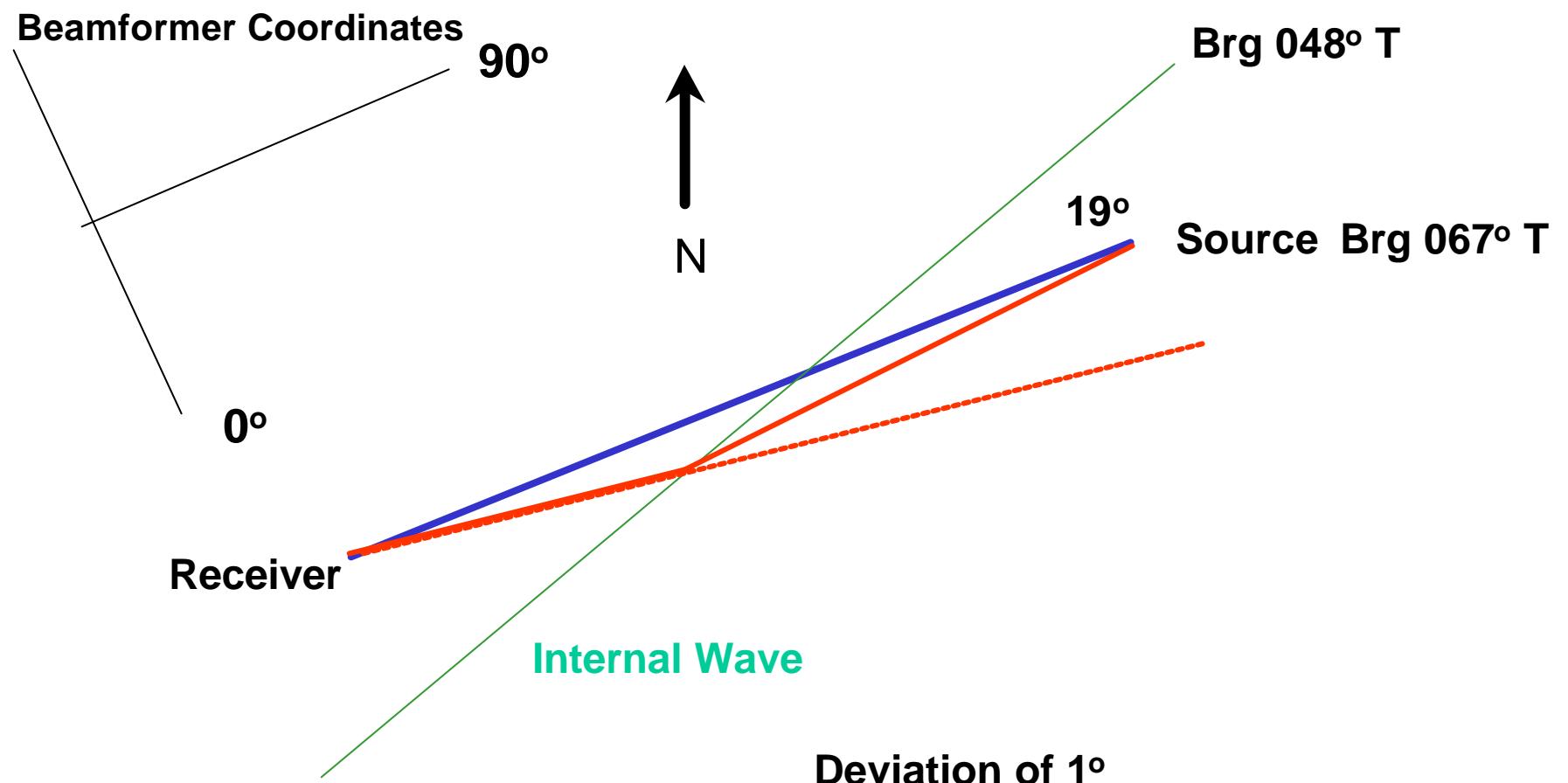




CONVENTIONAL LINEAR BEAMFORM



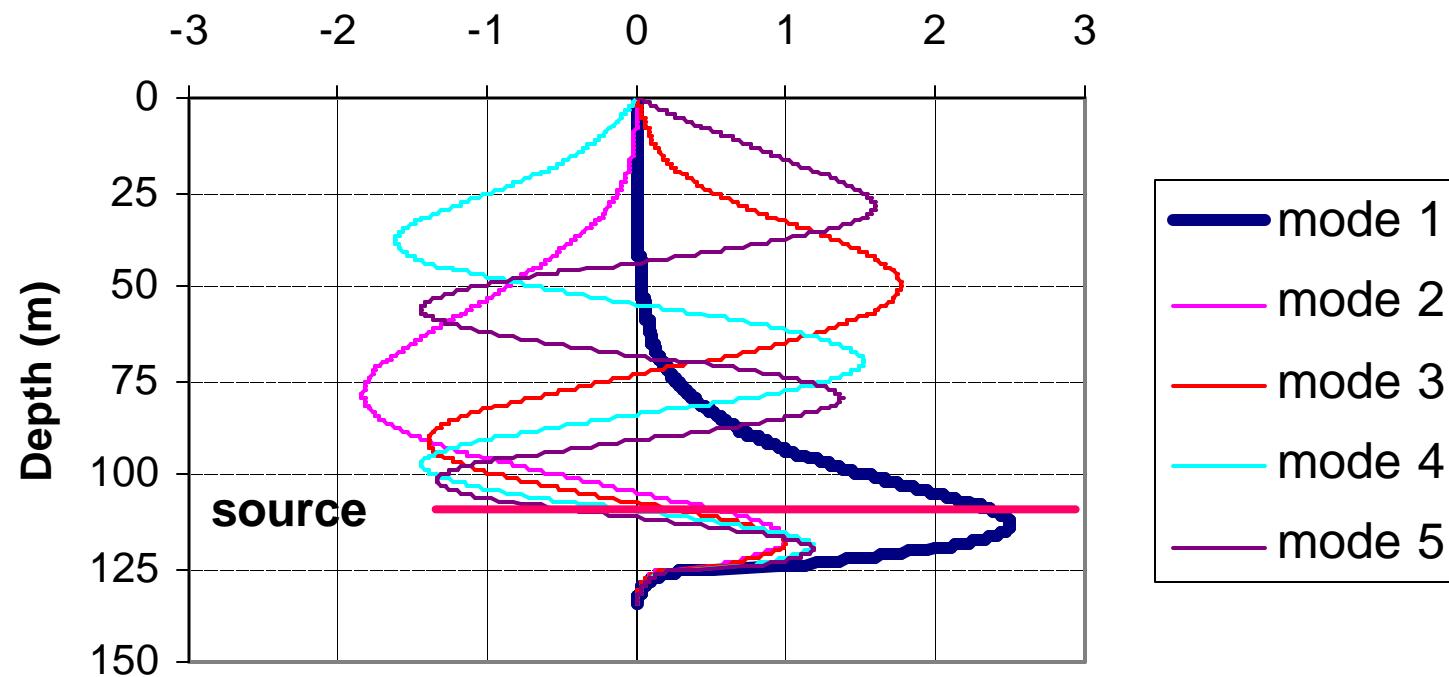




Deviation of 1°
Observed at 2300Z
5 May 2001
Requires ~10 m/s
Phase Speed Decrease

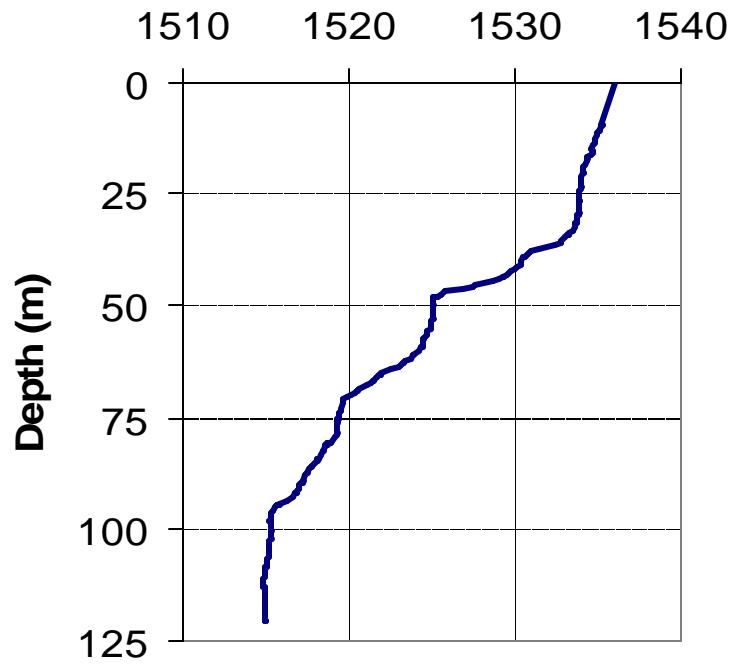
JD125.4 2001 profile

Mode Amplitudes at 300 Hz

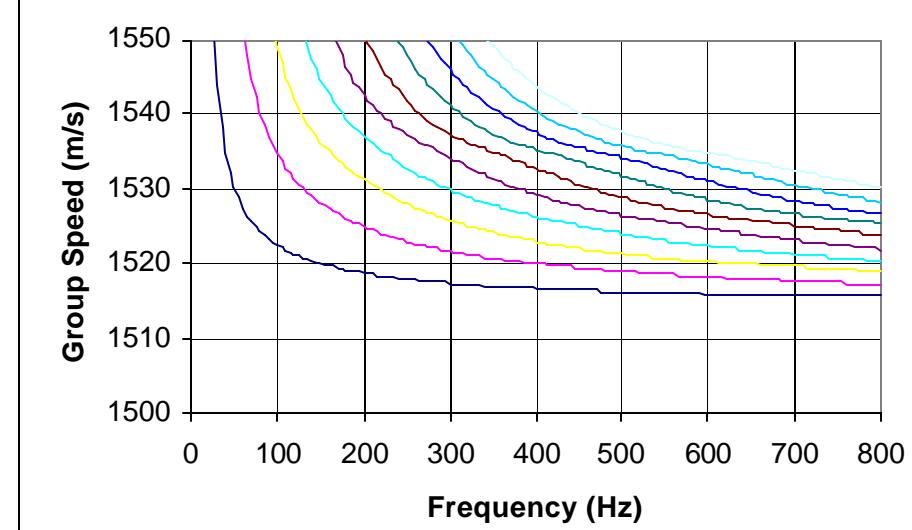


CTD cast 1010Z 05 May 01

Sound Speed (m/s)



Phase Speed CTD 1010Z 05May

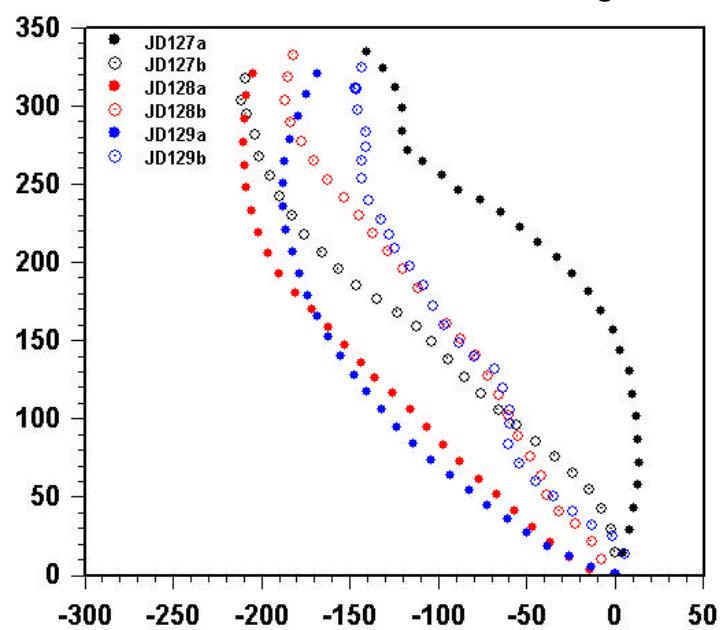
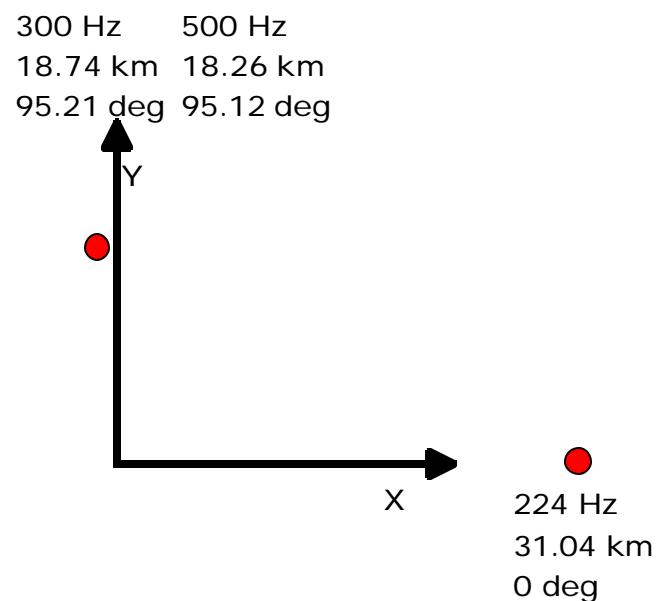


Preliminary Interpretation

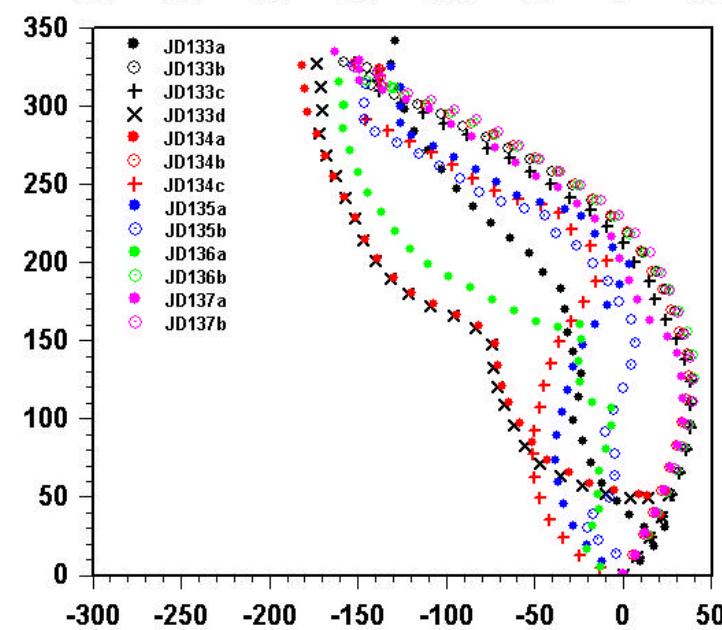
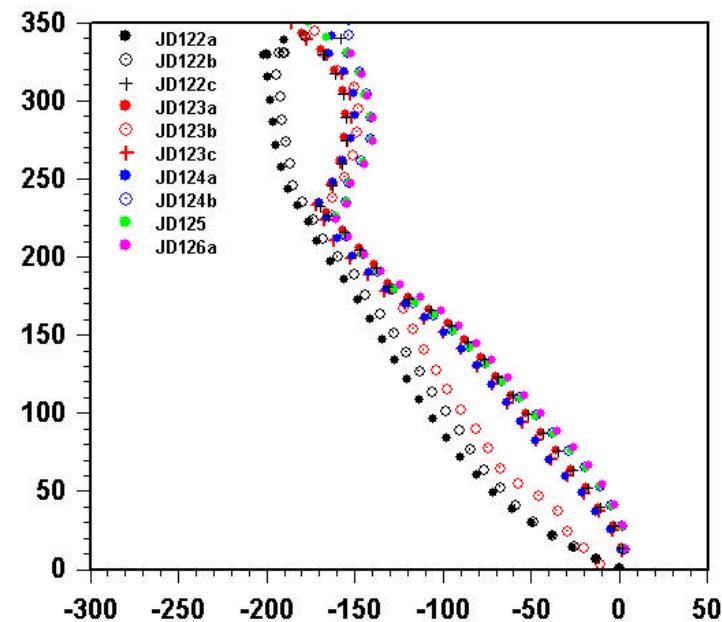
Most of energy in NB beam broadening can be attributed to biases associated with multimode (multiple phase-speed) propagation and non-broadside array

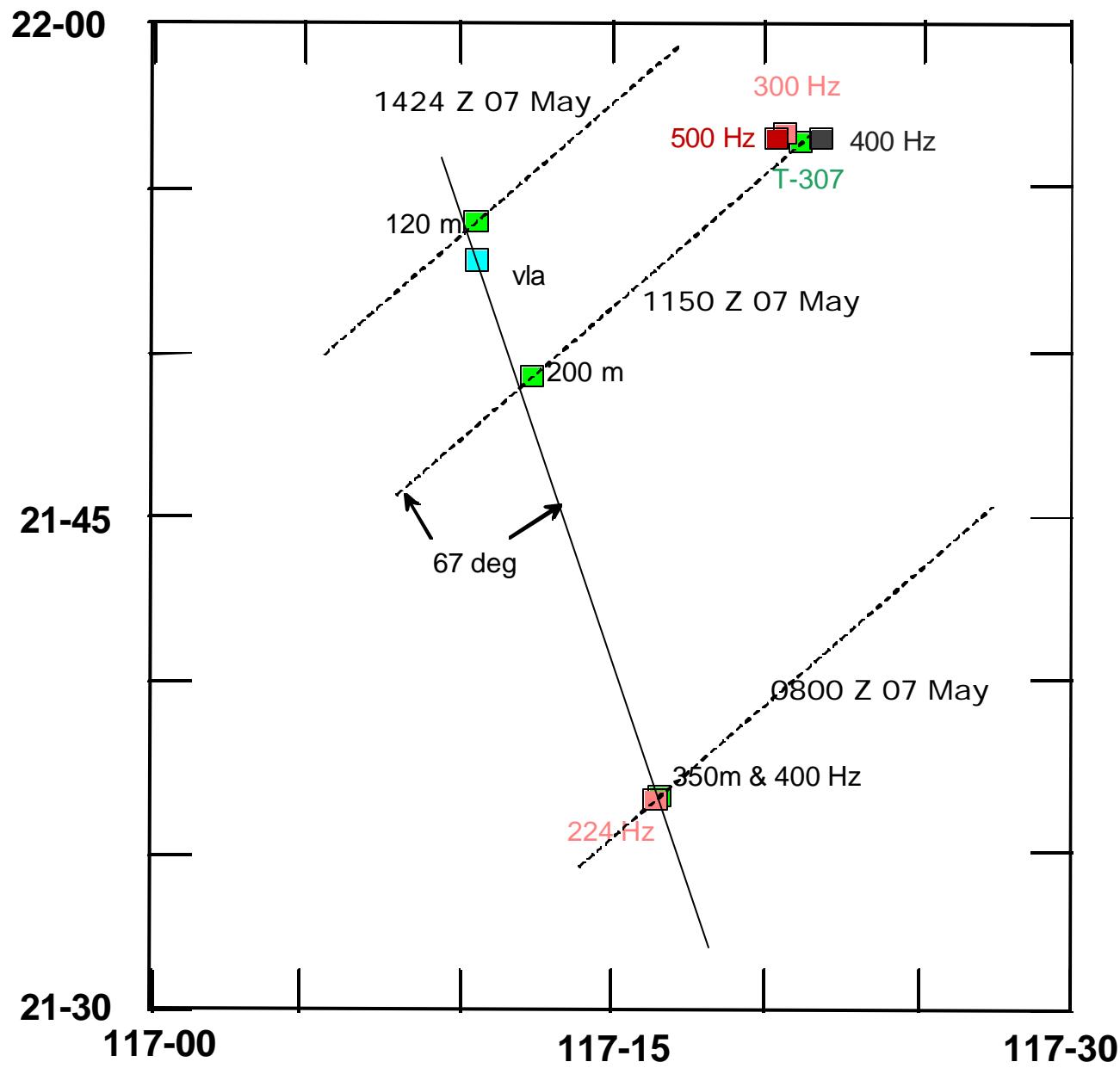
Some data may indicate refraction during coupling – work ongoing

Issues complicating observations would disappear at array broadside

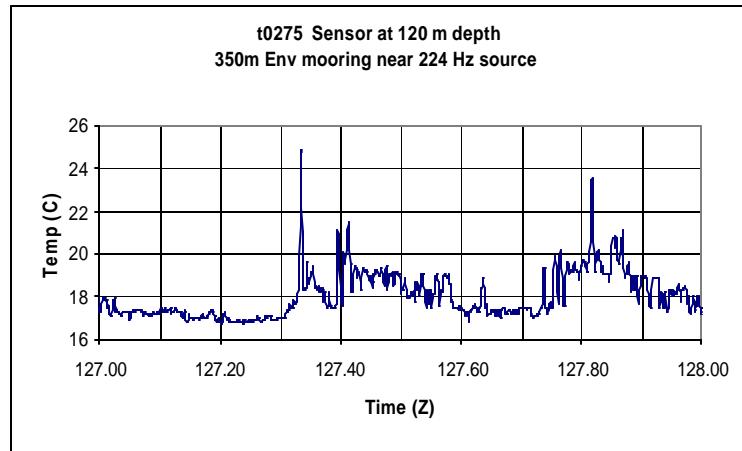


ELEMENT LOCATION RELATIVE TO CHANNEL W17

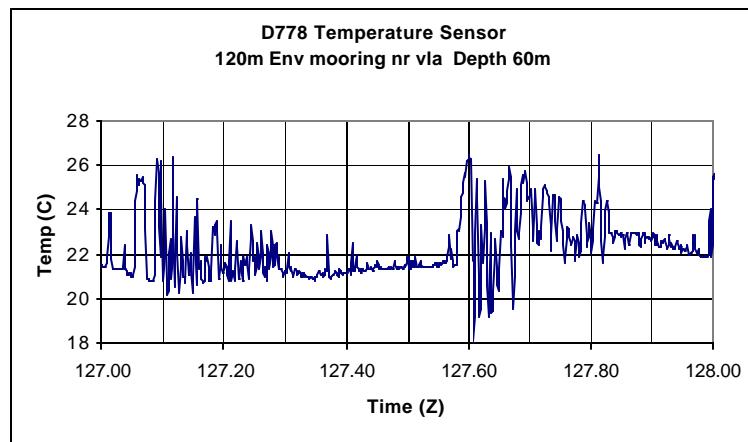




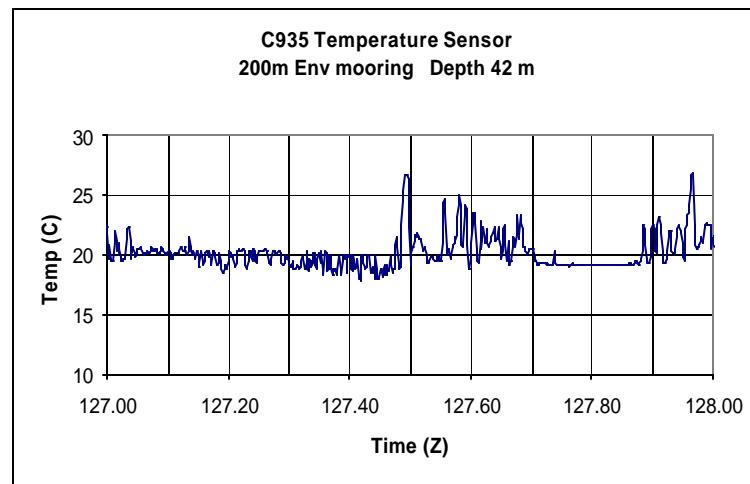
Source



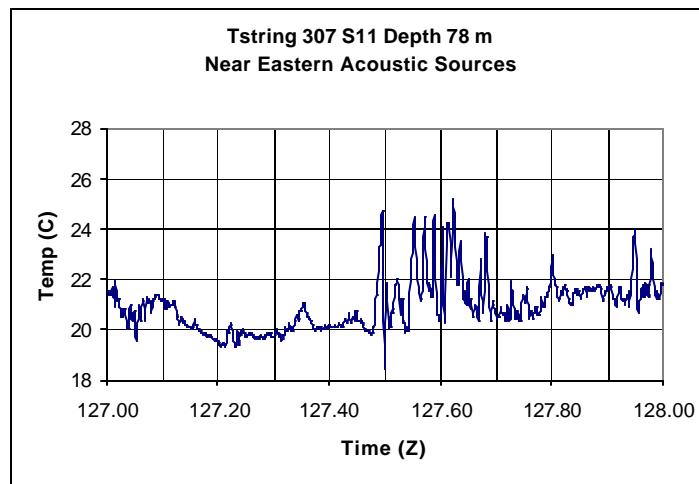
Receiver

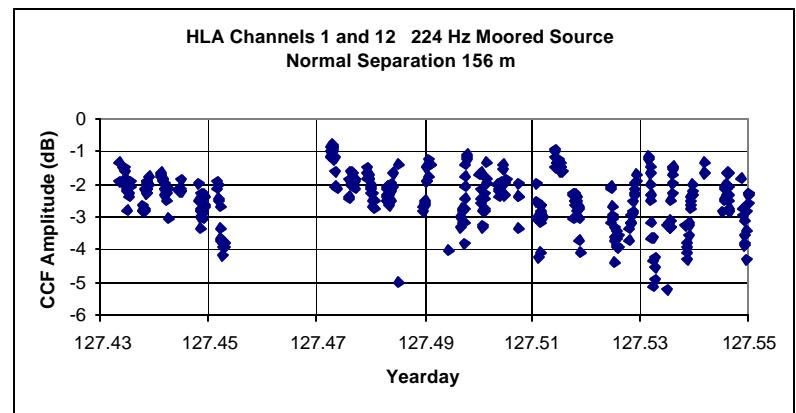
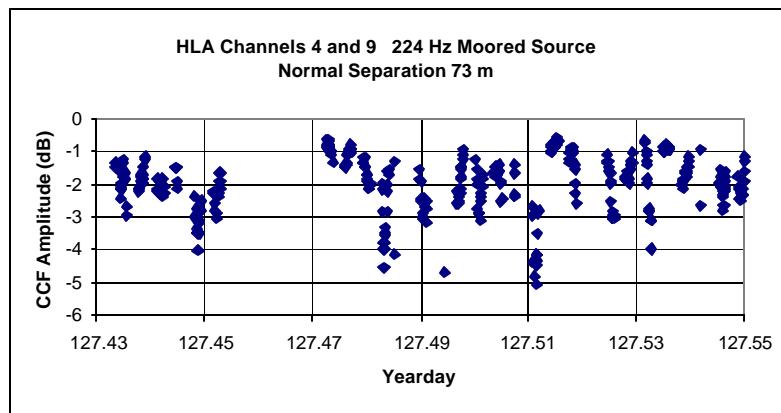
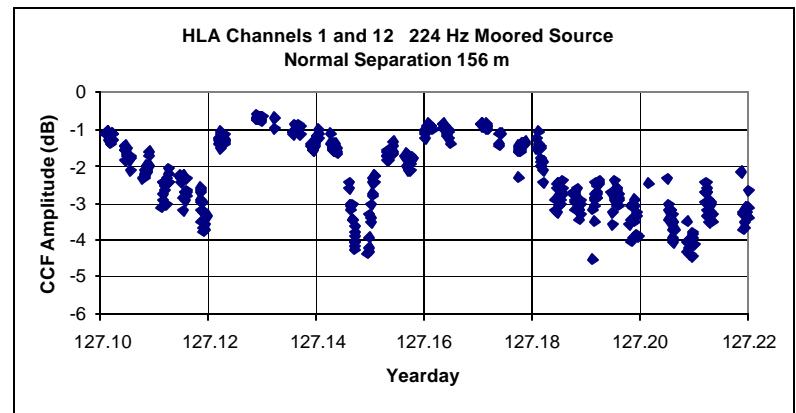
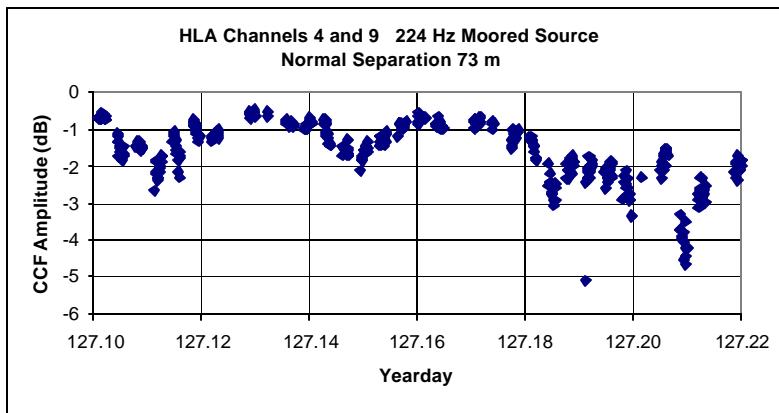


200 m Env



T-string 307





SUMMARY

Array element localizations and beam processing completed for 17 day data set

Aperture-limited beamwidths, near-ideal array signal gain found much of the time

Off-broadside narrowband beam broadening appears to be primarily due to multipath wave number differences

Some events may be due to horizontal refraction

Broadside-element cross-correlation suggests long coherence lengths with some fading due to internal waves

CrossCorr_v2 [F= 300 Hz, BW = 70 Hz, Ref = H32]

